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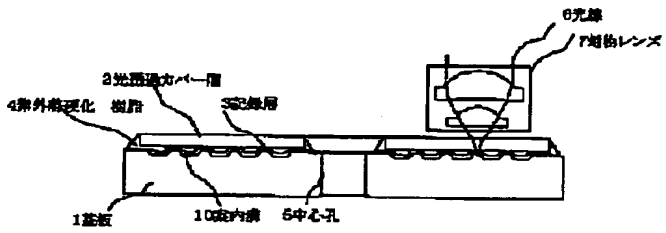
TITLE : OPTICAL RECORDING MEDIUM



ABSTRACT : PROBLEM TO BE SOLVED: To secure reliability in the outer and inner edge part of a disk susceptible to stripping, by making the external size of a light transmitting cover layer, which is stuck together with a substrate, smaller than that of the substrate.

SOLUTION: Since the outer diameter of a light transmitting cover layer 2 is formed smaller than that of a substrate 1, the part stuck together is not exposed to the outer peripheral end face of a disk. As a result, a shock imparted to the disk end face is not directly transmitted to the stuck part. Consequently, this structure increases strip resistivity of the cover layer 2 against a shock imparted to the disk end face. Further, since the inner diameter of the cover layer 2 is formed larger than that of the substrate 1, the stuck part is not exposed to the inner peripheral end face of the disk. As a result, the cover layer 2 is less susceptible to stripping due to a possible contact in chucking the disk. In this case, the inner edge part is provided with an area where the substrate is exposed; therefore, chucking with this area enables highly accurate chucking.

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The optical recording medium characterized by the appearance of said light transmission cover layer being smaller than the appearance of said substrate in the optical recording medium which has the recording layer of at least one layer, and stuck said substrate and said light transmission cover layer between light transmission cover layers thinner than a substrate and the substrate concerned.
[Claim 2] It is optical recording equipment according to claim 1 characterized by for said substrate and said light transmission cover layer having the shape of the approximate circle board which has a main hole, and for the outer diameter of said light transmission cover layer being smaller than the outer diameter of said substrate, and the bore of said light transmission cover layer being larger than the bore of said substrate.
[Claim 3] It consists of the inner circumference section which has a flat field. said substrate -- the rim section of the outermost periphery, the common-law marriage section around a main hole, and abbreviation -- the thickness of said rim section or said common-law marriage section It is the optical recording medium according to claim 2 characterized by the circumradius of said light transmission cover layer being smaller than r0, and the inradius of said light transmission cover layer being larger than r1 when it is formed thickly [said inner circumference section] more thickly and the inradius of said rim section is made into the circumradius r1 of r0 and said common-law marriage section.
[Claim 4] It is the optical recording medium according to claim 3 characterized by the thick difference deltat1 of said rim section and said inner circumference section being deltat1<t0 when thickness of said light transmission cover layer is set to t0.
[Claim 5] It is the optical recording medium according to claim 3 characterized by the thick difference deltat2 of said common-law marriage section and said inner circumference section being deltat2>t0 when thickness of said light transmission cover layer is set to t0.
[Claim 6] It is the optical recording medium which welding is carried out while pasting up said substrate and said light transmission cover layer with adhesives in the optical recording medium which has the recording layer of at least one layer between light transmission cover layers thinner than a substrate and the substrate concerned, and stuck said substrate and said light transmission cover layer, and is characterized by **.
[Claim 7] The optical recording medium according to claim 6 characterized by forming the projection in said welding part.
[Claim 8] The optical recording medium according to claim 1 to 5 characterized by having a two-layer recording layer between said substrates and said light transmission cover layers, for light being irradiated from said substrate side by the recording layer by the side of said substrate, and for light being irradiated from said light transmission cover layer side by the recording layer by the side of said light transmission cover layer, and carrying out reading appearance of the information from each recording layer.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] It has a light transmission cover layer in the light source side of a recording layer, light is irradiated using an objective lens from this light transmission cover layer side, and this invention relates to the optical recording medium with which informational record and playback are performed.
[0002]
[Description of the Prior Art] An optical information recording method has many advantages of being able to respond to each memory gestalt of that record and playback can be performed by 1 non-contact, that single or more figures can attain high recording density compared with 2 magnetic-recording methods, the mold only for 3 playbacks, a postscript mold, and a rewritable mold, and the application broad from industrial use to a noncommercial use as a method which enables implementation of a cheap mass file is considered.
[0003] As for the compact disk (CD) which is a disk for music only for playbacks in this, and the mini disc (MD) in which an account rec/play student is possible, most number is accepted in the commercial scene. These disks have a light transmission substrate with a thickness of 1.2mm, and have the information recording layer and the protective layer which protects it in one side of a light transmission substrate. In CD or MD, incidence of the light with a wavelength of 780nm is carried out from the opposite hand of an information recording layer through the objective lens of NA (numerical aperture) =0.45 to this light transmission substrate, and informational record or playback is performed.
[0004] By the way, to an optical disk, there is want of wanting to store the data of large quantities, such as image information, and examination of densification is progressing. In the case of an optical disk, recording density is decided in general by spot size of the light beam on a disk. since spot size is proportional to lambda/NA -- the big factor of densification -- short-wavelength-izing and high NA -- it is-izing.
[0005] However, since the comatic aberration generated with the inclination of a disk became large in proportion to the cube of NA, the margin to the inclination of a disk became very small by high NA-ization, the beam faded with few inclinations, and it had a technical problem of it becoming impossible to realize densification.
[0006] When thickness of the light transmission substrate of a disk is set to t, comatic aberration is proportional to t-NA3. In the digital versatile disc (DVD), while obtaining sufficient inclination margin also to NA=0.6 and the optical system formed into the high numerical aperture by making thickness of a light transmission substrate thin compared with 0.6 (mm), CD, or MD, by short wavelength-ization to 780nm to 650nm, high recording density-ization was realized, it was made the capacity of 4.7GB, and time amount, and image chart lasting time of a little more than 2 hours is realized.
[0007] However, want to large capacity and long duration record is becoming high further. The optical recording medium storable in one side as shown in JP,10-302310,A 8GB as this solution is proposed.
[0008] In this patent, NA is set from 0.6 or more [still higher] to 0.78, and densification is in drawing. However, since a disk inclination margin becomes severe in order to press down the

comatic aberration by the inclination of a disk as mentioned above, if high NA is formed, thickness of the substrate which penetrates light is made thin and it is made to make generating of the aberration over an angle of inclination as small as possible.
[0009]
[Problem(s) to be Solved by the Invention] Thus, if NA becomes large about with 0.8, it is necessary to make thickness of a light transmission substrate thin to about 0.1mm. However, if a light transmission substrate becomes thin, since it becomes impossible to maintain rigidity, it will be necessary to see from the light source and to form the substrate for reinforcement in the background of a light transmission substrate only with a light transmission substrate. Therefore, it becomes a substrate thick as a disk with which NA can respond to high optical system with high rigidity, and the lamination structure of having a recording layer between thin light transmission cover layers. This cross-section structure is shown in drawing 11. It consisted of thermoplastics, the recording layer 3 was formed of the spatter on the substrate 1 with which the guide rail 10 was imprinted at the time of molding, and the light transmission cover layer 2 has pasted up with ultraviolet-rays hardening resin 4 on it.
[0010] Moreover, in about [NA=0.8] high NA pickup optical system, since the focal distance of a lens becomes short, spacing on a lens and the front face of a disk (working distance) will become short with about 0.3mm. If working distance is short, it is necessary to take the collision of a sudden disk and a lens into consideration, and to choose an ingredient with a degree of hardness also as a light transmission cover layer to some extent.
[0011] However, there was a degree of hardness, since it had structure which stuck with adhesives the layer which is two sheets from which rigidity differs, when an impact joined the lamination section, the thin light transmission cover layer deformed greatly, and the technical problem that it became easy to exfoliate occurred.
[0012] Furthermore, since the lamination section of a disk was exposed to the outside end face of a disk, when dealing with a disk, an impact tended to be added to this end face, and the technical problem that a lamination side tends to exfoliate occurred.
[0013] Moreover, when the lamination section of a disk was exposed to a disk feed hole and attached a disk in a drive, an impact tended to be added to this lamination section, and the technical problem that a lamination side tends to exfoliate occurred.
[0014] This invention protects the disk rim section and the common-law marriage section which especially exfoliation tends to generate in view of the above-mentioned technical problem in the optical recording medium which has the structure which stuck the light transmission layer thinner than a substrate and a substrate, and aims at offering the optical recording medium with which the dependability over exfoliation is secured.
[0015]
[Means for Solving the Problem] Since this invention makes the above-mentioned object attain, it is made by it, and this invention has the recording layer of at least one layer between light transmission cover layers thinner than a substrate and the substrate concerned, and the appearance of said light transmission cover layer is characterized by being smaller than the appearance of said substrate in the optical recording medium which stuck said substrate and said light transmission cover layer.
[0016] Moreover, this invention has the shape of the approximate circle board in which said substrate and said light transmission cover layer have a main hole, the outer diameter of said light transmission cover layer is smaller than the outer diameter of said substrate, and the bore of said light transmission cover layer is characterized by being larger than the bore of said substrate.
[0017] It consists of the inner circumference section which has a flat field. moreover, this invention -- said substrate -- the rim section of the outermost periphery, the common-law marriage section around a main hole, and abbreviation -- the thickness of said rim section or said common-law marriage section When it is formed thickly [said inner circumference section] more thickly and the inradius of said rim section is made into the circumradius r1 of r0 and said common-law marriage section, the circumradius of said light transmission cover layer is smaller than r0, and the inradius of said light transmission cover layer is characterized by being larger than r1.
[0018] Moreover, when this invention sets thickness of said light transmission cover layer to t0, the thick difference deltat1 of said rim section and said inner circumference section is characterized by

being deltat1<t0.
[0019] Moreover, when this invention sets thickness of said light transmission cover layer to t0, the thick difference deltat2 of said common-law marriage section and said inner circumference section is characterized by being deltat2>t0.
[0020] Moreover, this invention has the recording layer of at least one layer between light transmission cover layers thinner than a substrate and the substrate concerned, in the optical recording medium which stuck said substrate and said light transmission cover layer, while pasting up with adhesives, welding of said substrate and said light transmission cover layer is carried out, and they are characterized by **.
[0021] Moreover, this invention is characterized by forming the projection in said welding part.
[0022] Moreover, this invention is characterized by having a two-layer recording layer between said substrates and said light transmission cover layers, for light being irradiated from said substrate side by the recording layer by the side of said substrate, and for light being irradiated from said light transmission cover layer side by the recording layer by the side of said light transmission cover layer, and carrying out reading appearance of the information from each recording layer.
[0023]
[Embodiment of the Invention] Hereafter, the gestalt of concrete operation of this invention is explained to a detail. In addition, the following explanation explains a disc-like optical record medium (an optical disk is called henceforth).
The cross-section structure of the optical disk about an example 1 is shown in [example 1] drawing 1 , and the perspective view of a substrate 1 and the light transmission cover layer 2 is shown in drawing 2 .
[0024] A substrate 1 consists of thermoplastics, such as a polycarbonate, and when cast by metal mold, the guide rail 10 on an approximately concentric circle is imprinted. The slot of the shape of a land / a groove is sufficient as this guide rail 10, and a pit is sufficient as it. When the depth of a slot or a pit sets wavelength of a beam of light 6 to lambda, lambda/8 which a cross talk cannot generate easily, and lambda/4 to which the modulation factor by the pit becomes the highest are used. Anyway, a tooth depth is below the wavelength of light.
[0025] On a guide rail 10, a recording layer 3 is formed by means, such as a spatter. As this recording layer 3, reflective film [, such as film in which multiple-times record is possible, and aluminum for / a certain / being and reproducing information from the film of a pigment system recordable once or a pit,], such as a phase change and optical MAG, is formed.
[0026] Furthermore, the light transmission cover layer 2 is pasted up through the ultraviolet-rays hardening resin 4 which is adhesives on it. The light transmission cover layer 2 uses the sheet metal from which glass or the film of a polycarbonate was clipped to concentric circular.
[0027] In case a substrate 1 and the light transmission cover layer 2 are pasted up, it pastes up by irradiating UV light, after impressing a predetermined pressure with the pressure plate which is not illustrated, and stiffening ultraviolet-rays hardening resin 4.
[0028] In performing informational record or playback, it condenses a beam of light 6 from the light transmission cover layer 2 side to a recording layer 3 with an objective lens 7. If it is going to attain one twice the surface recording density of DVD on the same wavelength as DVD, as NA of an objective lens 7, it will become a value of 0.6x1.4 and about 0.84. In this NA, when it is going to obtain the inclination margin of a disk comparable as CD, the thickness of the light transmission cover layer 2 should just take 1.2x(0.45/0.84) 3 and the value of about 0.18mm or less.
[0029] An example of the metal mold at the time of casting a substrate 1 to drawing 3 is shown. When a substrate 1 is cast by metal mold 8a and 8b, the guide rail of the shape of an approximately concentric circle currently beforehand formed on metal mold 8a is imprinted by the substrate 9 immediately after molding. Although there is no feed hole in the substrate 9 immediately after molding, a hole is made in a core by the cutter which is not illustrated after molding.
[0030] In drawing 1 , since the outer diameter of the light transmission cover layer 2 is smaller than the outer diameter of a substrate 1, the lamination section has not exposed it to the periphery end face of a disk. For this reason, the impact which joined the disk end face does not have direct intermediary straw in the lamination section. Therefore, according to this structure, the peel strength of the light transmission cover layer to the impact which joined the disk end face increases.

[0031] Moreover, since the bore of the light transmission cover layer 2 is larger than the bore of a substrate 1, the lamination section has not exposed it to the inner circumference end face of a disk. Exfoliation of the light transmission cover layer by the contact at the time of carrying out chucking of the disk by this stops being able to happen easily. Moreover, since the part which the substrate has exposed to the common-law marriage section in this case is made, if chucking of the disk is carried out in this part, chucking with a high precision will become possible.
The [example 2] example 2 is explained using drawing 4 , drawing 5 , and drawing 6 .
[0032] As shown in drawing 4 , in the substrate 1, to the substrate thickness of the inner circumference section 11 in which the guide rail 10 is formed, thickness formed the thick rim section 12 near the outer diameter, and provides the common-law marriage section 13 with thick thickness near the feed hole similarly in this example. In addition, since it is the same as that of the 1st example about structures other than the above, explanation is omitted here.
[0033] By taking this configuration, it becomes a substrate 1 and the form where the rim section 12 and the common-law marriage section 13 protect the lamination section which stuck the light transmission cover layer 2, and since the contact force in the case of the impact and chucking which joined the disk end face stops being able to join a lamination side directly easily, the reinforcement to exfoliation of the light transmission cover layer 2 and a substrate 1 increases.
[0034] In drawing 4 (a), when a light transmission cover layer makes the inradius of the rim section the circumradius r1 of r0 and the common-law marriage section, as for the circumradius of this light transmission cover layer, the inradius of this light transmission cover layer has the larger appearance than r1 smaller than r0.
[0035] Moreover, in drawing 4 (a), thick increment of the rim section 12 to the substrate thickness of the inner circumference section 11 of a substrate 1 is set to deltat1<t0, when thickness of deltat1 and the light transmission cover layer 2 is set to t0.
[0036] As shown in drawing 4 (b) at the time of lamination, a lamination pressure is applied for a substrate 1 and the light transmission cover layer 2 with the application-of-pressure version 15, and ultraviolet rays are irradiated with the UV lamp 16, and it pastes up. In case a lamination pressure is applied, if it is deltat1 >=t0, the rim section 12 will serve as a lug and it will become easy to produce pressure unevenness at the time of lamination. In order to apply a uniform pressure to the whole light transmission cover layer 2, what applied the thickness of the ultraviolet-rays hardening resin 4 at the time of deltat1 and adhesion needs to become smaller than t0, and there must be deltat1 at least smaller than t0.
[0037] Moreover, the common-law marriage section can be made to project rather than the light transmission cover layer 2 by making the application-of-pressure version which applies a pressure at the time of lamination into the structure which escapes the common-law marriage section 13 of a substrate 1 like 15a and 15b of drawing 5 (b), as shown in drawing 5 (a). In drawing 5 (a), when thickness of deltat2 and the light transmission cover layer 2 is set to t0 for the thick increment of the common-law marriage section 13 to the substrate thickness of the inner circumference section 11 of a substrate 1, it is set to deltat2>t0.
[0038] Since the lamination side of a substrate 1 and the light transmission cover layer 2 is not exposed to a feed hole, it is hard coming to generate exfoliation of the light transmission cover layer 2 in the common-law marriage section 13 according to this structure.
[0039] Furthermore, another advantage of this structure is explained using drawing 6 . A disk substrate is attached in the turntable 18 on a motor 19 by chucking 17 in drawing 6 . The installation precision of a disk is decided by precision of a turntable 18, a disk underside, and a chucking 17 and a disk top face. By the disk maintenance approach illustrated to drawing 6 , since not the front face of the stuck cover layer but the high molding side of precision can be held as a datum plane in case a disk is attached in a drive, it is hard to generate the inclination (field blurring) of the disk side by a disk inclining and being attached at the time of chucking.
The [example 3] example 3 is explained using drawing 7 and drawing 8 .
[0040] Cross-section structural drawing of the disk of this example is shown in drawing 7 , and a cross-section perspective view is shown in drawing 8 . Since it is the same as that of the 1st and 2nd examples about fundamental structure, it omits.
[0041] Becoming the description in this example used resin ingredients, such as a polycarbonate, for

the both sides of a substrate 1 and the light transmission cover layer 2, and it formed the height 14 in the rim section 12 and the common-law marriage section 13 of a substrate 1. This height 14 is in the place where the substrate 1 and the light transmission cover layer 2 touch at the time of the application of pressure for adhesion. While pasting up with ultraviolet-rays hardening resin 4 with UV lamp, this part that touches is welded with heating or a supersonic wave. Thereby, adhesion of the disk common-law marriage section and the rim section is strengthened, and the reinforcement to exfoliation can be raised.

The [example 4] example 4 is explained using drawing 9 and drawing 10 .

[0042] As this example, the lamination section protection in the lamination disk whose recording layer is two-layer is explained.

[0043] Although the 1st to 3rd example used and explained sheet metal, such as a polycarbonate or glass, mainly to the light transmission cover layer 2, as shown in drawing 9 , in the case of thermoplastic resin like a polycarbonate, the guide rail close light transmission cover layer 20 can be formed by molding. In this case, as shown in drawing 9 , a disk with two layers of recording layers is realizable by forming a recording layer in the both sides of the guide rail of a substrate 1, and the guide rail of the guide rail close light transmission cover layer 20, being filled up with ultraviolet-rays hardening resin 4 between them, and pressurizing and UV hardening. It is possible for the 1st recording layer 3a and the 2nd recording layer 3b to mind an objective lens 7, and to record or reproduce information with a beam of light 6 from the guide rail close light transmission cover layer 20 side, by making proper the permeability of 1st recording layer 3a and 2nd recording layer 3b, as shown in drawing 9 . By adopting the configuration shown in the 1st to 3rd example also in this case, it is possible to be able to do with the structure which the lamination section does not expose to the end face of a disk directly, and to prevent exfoliation of a substrate and a cover layer.

[0044] Moreover, the recording density of 2nd recording layer 3b formed in the guide rail of the guide rail close light transmission cover layer 20 with the same configuration By setting up corresponding to objective lens 7a of the high objective lens 1st of NA, and setting up the recording density of 1st recording layer 3a formed in the guide rail of a substrate 1 corresponding to 2nd objective lens 7b which is the low objective lens of NA As shown in drawing 10 , it is able for recording density to read 2nd high recording layer 3b from a cover layer side, and to reproduce 1st recording layer 3a with low recording density from a substrate side. At this time, as a substrate 1, if a thing with a thickness of 1.2mm is used, both CD compatible recording layer and a high density recording layer are realizable with the same disk. Moreover, as a substrate 1, if a thing with a thickness of 0.6mm is used, both a DVD compatible recording layer and a high density recording layer are realizable with the same disk. The compatible disk which can also record or reproduce the drive of the specification from which CD, DVD, etc. differ by doing in this way can be offered.

[0045]

[Effect of the Invention] Since the lamination section of a light transmission cover layer and a substrate is not exposed to the periphery and inner circumference of a disk according to this invention so that clearly from the above explanation, a direct impact does not join the lamination section and it is hard to generate exfoliation of a cover layer.

[0046] Moreover, since the rim section and the common-law marriage section prepared in the periphery and inner circumference of a disk protect the lamination section of a light transmission cover layer and a substrate according to this invention, a direct impact does not join the lamination section and it is hard to generate exfoliation of a cover layer.

[0047] Moreover, according to this invention, in order to weld the rim section or the common-law marriage section in addition to adhesion of a substrate and a light transmission cover layer, the peel strength at the time of an impact being added increases.

[0048] Moreover, according to this invention, the increase of the adhesion of a substrate and a cover layer and welding reinforcement increase by projection.

[0049] Moreover, according to this invention, in the lamination disk which cannot exfoliate easily, transposition with CD/DVD can be realized easily.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is cross-section structural drawing of the optical disk of an example 1.
[Drawing 2] It is the perspective view of a substrate and a light transmission cover layer.
[Drawing 3] It is an outline sectional view explaining the molding approach of a substrate.
[Drawing 4] It is cross-section structural drawing of the optical disk of an example 2.
[Drawing 5] It is cross-section structural drawing of other optical disks of an example 2.
[Drawing 6] It is the mimetic diagram showing the medium attaching part of an optical recording regenerative apparatus which carried the optical disk of an example 2.
[Drawing 7] It is cross-section structural drawing of the optical disk of an example 3.
[Drawing 8] It is the cross-section perspective view of the optical disk of an example 3.
[Drawing 9] It is cross-section structural drawing of the optical disk of an example 4.
[Drawing 10] It is cross-section structural drawing of other optical disks of an example 4.
[Description of Notations]
1 Substrate
2 Light Transmission Cover Layer
3 Recording Layer
3a The 1st recording layer
3b The 2nd recording layer
4 Ultraviolet-Rays Hardening Resin
5 Feed Hole
6 Beam of Light
6a The 1st beam of light
6b The 2nd beam of light
7 Objective Lens
7a The 1st objective lens
7b The 2nd objective lens
8a The 1st metal mold
8b The 2nd metal mold
9 Substrate immediately after Molding
10 Guide Rail
11 Inner Circumference Section
12 Rim Section
13 Common-law Marriage Section
14 Height
15 Pressure Plate
15a The 1st pressure plate
15b The 2nd pressure plate
16 UV Lamp
17 Chucking
18 Turntable
19 Motor
20 Guide Rail Close Light Transmission Cover Layer

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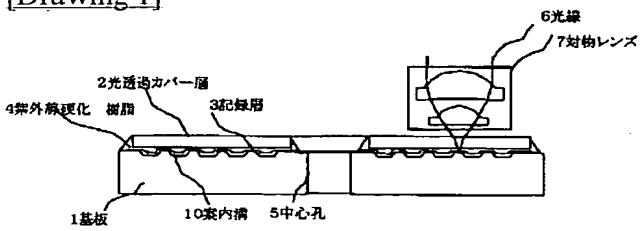
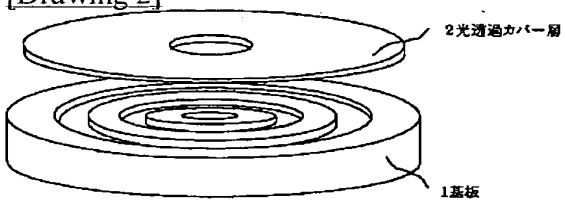
DRAWINGS

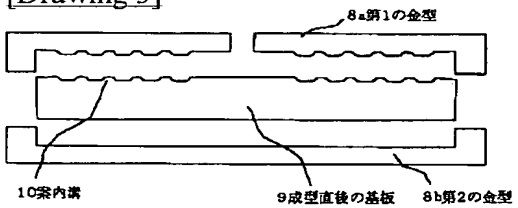
[Drawing 1]



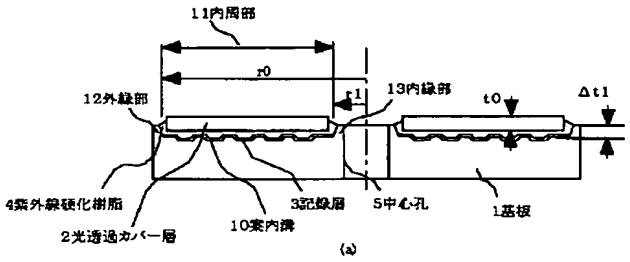
[Drawing 2]

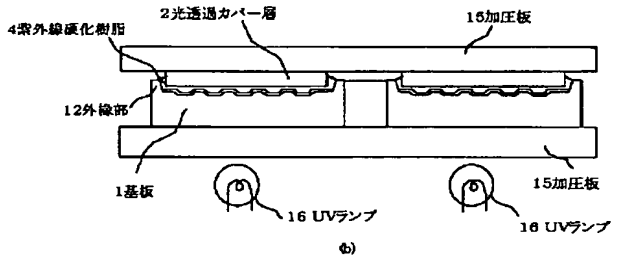


[Drawing 3]

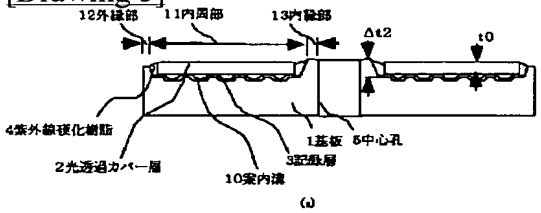


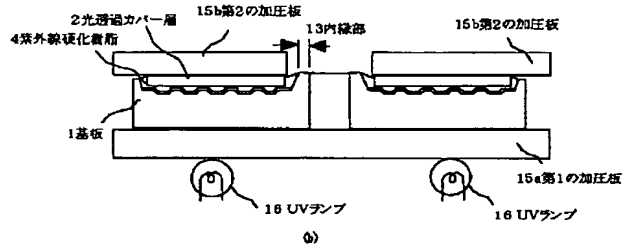
[Drawing 4]



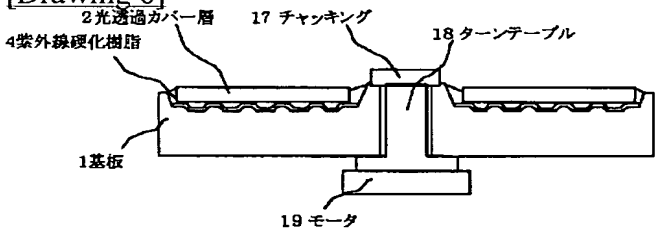


[Drawing 5]

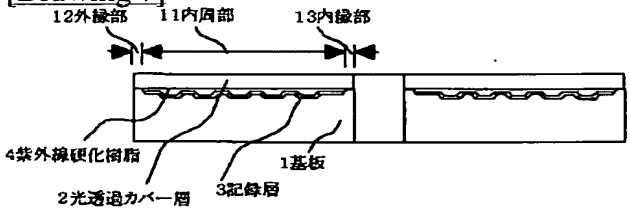




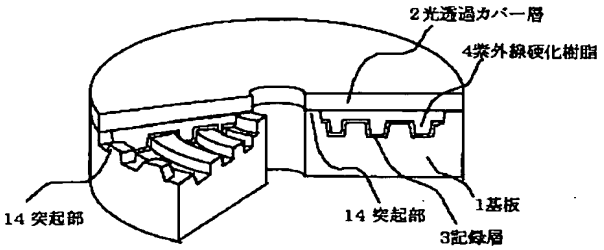
[Drawing 6]



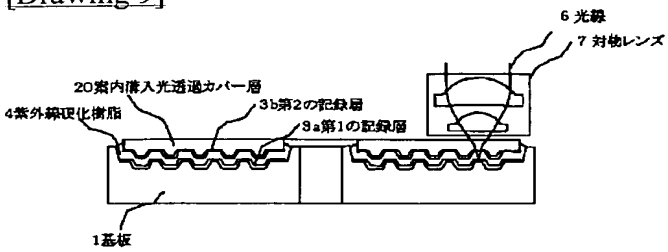
[Drawing 7]



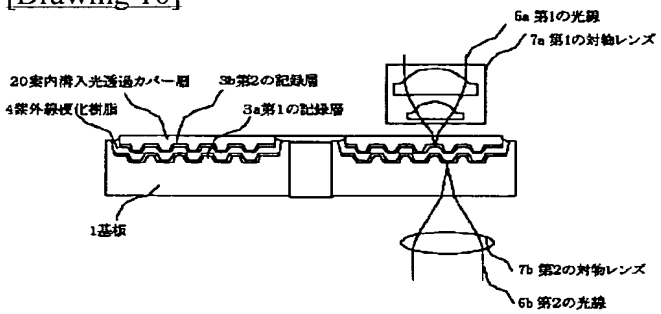
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]

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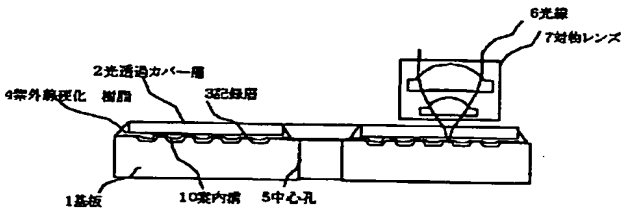
(54)【発明の名称】　光記録媒体

(57)【要約】
【課題】　ディスク基板と光透過カバー層を貼り合せるディスクにおいて、外縁部・内縁部の貼り合わせ層を保護し、カバー層の剥離強度を強化する。
【解決手段】　ディスク基板の直径をカバー層の直径より大きくし、ディスク基板の外縁を高くすることでディスク基板とカバー層の貼り合せ面が外周に露出しない構造とする。



【特許請求の範囲】
【請求項１】　基板と当該基板より薄い光透過カバー層との間に少なくとも１層の記録層を有し、前記基板と前記光透過カバー層とを貼り合せた光記録媒体において、前記光透過カバー層の外形が前記基板の外形よりも小さいことを特徴とする光記録媒体。
【請求項２】　前記基板および前記光透過カバー層は中心穴を有する略円盤状であり、
前記光透過カバー層の外径は前記基板の外径より小さく、且つ前記光透過カバー層の内径は前記基板の内径より大きいことを特徴とする請求項１記載の光記録装置。
【請求項３】　前記基板は、最外周の外縁部、中心穴の周囲の内縁部、略平坦な面を有する内周部からなり、
前記外縁部或いは前記内縁部の肉厚は、前記内周部の肉厚より厚く形成され、前記外縁部の内半径をｒ０、前記内縁部の外半径ｒ１としたとき、前記光透過カバー層の外半径はｒ０より小さく、且つ前記光透過カバー層の内半径はｒ１より大きいことを特徴とする請求項２記載の光記録媒体。
【請求項４】　前記光透過カバー層の厚さをｔ０としたとき、前記外縁部と前記内周部の肉厚の差Δｔ１は、Δｔ１＜ｔ０であることを特徴とする請求項３記載の光記録媒体。
【請求項５】　前記光透過カバー層の厚さをｔ０としたとき、前記内縁部と前記内周部の肉厚の差Δｔ２は、Δｔ２＞ｔ０であることを特徴とする請求項３記載の光記録媒体。
【請求項６】　基板と当該基板より薄い光透過カバー層との間に少なくとも１層の記録層を有し、前記基板と前記光透過カバー層とを貼り合せた光記録媒体において、前記基板と前記光透過カバー層は、接着剤によって接着されると共に、融着されているを特徴とする光記録媒体。
【請求項７】　前記融着部分に突起が形成されていることを特徴とする請求項６記載の光記録媒体。
【請求項８】　前記基板と前記光透過カバー層との間に２層の記録層を有し、前記基板側の記録層に前記基板側から光が照射され、前記光透過カバー層側の記録層に前記光透過カバー層側から光が照射されて、各記録層から情報が読み出されることを特徴とする請求項１乃至５記載の光記録媒体。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、記録層の光源側に光透過カバー層を有し、この光透過カバー層側から対物レンズを用いて光が照射され、情報の記録及び再生が行われる光記録媒体に関するものである。
【０００２】
【従来の技術】光学情報記録方式は、１非接触で記録・再生が行えること、２磁気記録方式に比べて一桁以上も高い記録密度が達成できること、３再生専用型，追記型，書換可能型のそれぞれのメモリー形態に対応できる等の数々の利点を有し、安価な大容量ファイルの実現を可能とする方式として産業用から民生用まで幅広い用途が考えられている。
【０００３】このなかで、再生専用の音楽用ディスクであるコンパクトディスク（ＣＤ）や記録再生可能なミニディスク（ＭＤ）は市場にかなりの数が受け入れられている。これらのディスクは、厚さ１．２ｍｍの光透過基板を有し、光透過基板の一方には情報記録層と、それを保護する保護層を有している。ＣＤやＭＤではこの光透過基板に対して情報記録層の反対側からＮＡ（開口数）＝０．４５の対物レンズを介し、波長７８０ｎｍの光を入射し、情報の記録または再生を行う。
【０００４】ところで、光ディスクに対しては、映像情報など大量のデータを格納したいという要望があり、高密度化の検討が進んでいる。光ディスクの場合、記録密度はおおむねディスク上の光ビームのスポットサイズで決まる。スポットサイズはλ／ＮＡに比例するため、高密度化の大きな要因は短波長化と高ＮＡ化である。
【０００５】しかし、ディスクの傾きにより発生するコマ収差はＮＡの３乗に比例して大きくなるため、高ＮＡ化によってディスクの傾きに対するマージンが極めて小さくなり、わずかな傾きでビームがぼやけ、高密度化が実現できなくなるという課題があった。
【０００６】ディスクの光透過基板の厚さをｔとしたとき、コマ収差はｔ・ＮＡ^{3}に比例する。デジタル・バーサタイル・ディスク（ＤＶＤ）では、光透過基板の厚さを０．６（ｍｍ）とＣＤやＭＤに比べて薄くすることで、ＮＡ＝０．６と高開口数化された光学系に対しても十分な傾きマージンを得るとともに、７８０ｎｍから６５０ｎｍへの短波長化によって高記録密度化を実現し、容量４．７ＧＢ、時間にして２時間強の映像記録時間を実現している。
【０００７】しかし、さらに大容量・長時間記録への要望が高くなってきている。この解決策として、特開平１０－３０２３１０号公報に示すような、片面に８ＧＢ格納できる光記録媒体が提案されている。
【０００８】この特許では、ＮＡを０．６からさらに高い０．７８以上に設定し、高密度化を図っている。しかし、上述のように、高ＮＡ化するとディスクの傾きによるコマ収差を押さえるためにディスク傾きマージンが厳しくなるため、光を透過する基板の厚さを薄くして、傾き角に対する収差の発生をなるべく小さくするようにしている。
【０００９】
【発明が解決しようとする課題】このように、ＮＡが０．８程度と大きくなると、光透過基板の厚みは０．１ｍｍ程度にまで薄くする必要がある。しかし、光透過基板が薄くなると光透過基板だけでは剛性が保てなくなる

ため、光源から見て光透過基板の裏側に補強用の基板を設ける必要が生じる。したがって、ＮＡが高い光学系に対応できるディスクとしては、厚く剛性が高い基板と、薄い光透過カバー層の間に記録層を有する、貼り合せ構造となる。この断面構造を図１１に示す。熱可塑性樹脂からなり、成型時に案内溝１０が転写された基板１上にスパッタにより記録層３が形成され、その上に紫外線硬化樹脂４によって光透過カバー層２が接着されている。

【００１０】また、ＮＡ＝０．８程度の高ＮＡピックアップ光学系においては、レンズの焦点距離が短くなるため、レンズとディスク表面の間隔（ワーキングディスタンス）は例えば０．３ｍｍ程度と短くなってしまう。ワーキングディスタンスが短いと、突発的なディスクとレンズの衝突を考慮する必要があり、光透過カバー層としてもある程度硬度を有した材料を選択する必要がある。

【００１１】しかし、硬度があり、剛性の異なる２枚の層を接着剤により貼り合せた構造となっているため、貼り合せ部に衝撃が加わった際に薄い光透過カバー層が大きく変形し、剥離しやすくなるという課題があった。

【００１２】さらに、ディスクの貼り合せ部がディスクの外側端面に露出しているので、ディスクを取り扱う時に、この端面に対し衝撃が加わりやすく、貼り合せ面が剥離しやすいという課題があった。

【００１３】また、ディスクの貼り合せ部がディスク中心孔に露出しており、ディスクをドライブへ取り付ける時に、この貼り合わせ部に対し衝撃が加わりやすく、貼り合せ面が剥離しやすいという課題があった。

【００１４】本発明は、上記課題に鑑み、基板と基板より薄い光透過層を貼り合わせた構造を有する光記録媒体において、特に剥離が発生しやすいディスク外縁部および内縁部を保護し、剥離に対する信頼性が確保される光記録媒体を提供することを目的とする。

【００１５】

【課題を解決するための手段】本発明は上記目的を達成させるためになされたものであって、本発明は、基板と当該基板より薄い光透過カバー層との間に少なくとも１層の記録層を有し、前記基板と前記光透過カバー層とを貼り合せた光記録媒体において、前記光透過カバー層の外形が前記基板の外形よりも小さいことを特徴とするものである。

【００１６】また、本発明は、前記基板および前記光透過カバー層は中心穴を有する略円盤状であり、前記光透過カバー層の外径は前記基板の外径より小さく、且つ前記光透過カバー層の内径は前記基板の内径より大きいことを特徴とするものである。

【００１７】また、本発明は、前記基板は、最外周の外縁部、中心穴の周囲の内縁部、略平坦な面を有する内周部からなり、前記外縁部或いは前記内縁部の肉厚は、前記内周部の肉厚より厚く形成され、前記外縁部の内半径をｒ０、前記内縁部の外半径ｒ１としたとき、前記光透過カバー層の外半径はｒ０より小さく、且つ前記光透過カバー層の内半径はｒ１より大きいことを特徴とするものである。

【００１８】また、本発明は、前記光透過カバー層の厚さをｔ０としたとき、前記外縁部と前記内周部の肉厚の差Δｔ１は、Δｔ１＜ｔ０であることを特徴とするものである。

【００１９】また、本発明は、前記光透過カバー層の厚さをｔ０としたとき、前記内縁部と前記内周部の肉厚の差Δｔ２は、Δｔ２＞ｔ０であることを特徴とするものである。

【００２０】また、本発明は、基板と当該基板より薄い光透過カバー層との間に少なくとも１層の記録層を有し、前記基板と前記光透過カバー層とを貼り合せた光記録媒体において、前記基板と前記光透過カバー層は、接着剤によって接着されると共に、融着されているを特徴とするものである。

【００２１】また、本発明は、前記融着部分に突起が形成されていることを特徴とするものである。

【００２２】また、本発明は、前記基板と前記光透過カバー層との間に２層の記録層を有し、前記基板側の記録層に前記基板側から光が照射され、前記光透過カバー層側の記録層に前記光透過カバー層側から光が照射されて、各記録層から情報が読み出されることを特徴とするものである。

【００２３】

【発明の実施の形態】以下、本発明の具体的な実施の形態について詳細に説明する。なお、以下の説明では円盤状の光学記録媒体（以降、光ディスクと称する）について説明を行う。

［実施例１］図１に実施例１に関する光ディスクの断面構造を示し、図２に基板１と光透過カバー層２の斜視図を示す。

【００２４】基板１はポリカーボネートなどの熱可塑性樹脂からなり、金型により成型された際に略同心円上の案内溝１０が転写されている。この案内溝１０は、ランド／グルーブ状の溝でも良いし、ピットでも良い。溝、あるいはピットの深さは、光線６の波長をλとするとき、クロストークの発生しにくいλ／８や、ピットによる変調度が最も高くなるλ／４が用いられる。いずれにしても、溝の深さは光の波長以下である。

【００２５】案内溝１０の上にはスパッタ等の手段により記録層３が形成される。この記録層３としては相変化・光磁気など複数回記録可能な膜、あるい１回のみ記録可能な色素系の膜、あるいはピットから情報を再生するためのＡｌなどの反射膜が形成される。

【００２６】さらに、その上に接着剤である紫外線硬化樹脂４を介して光透過カバー層２を接着している。光透過カバー層２はガラス、あるいはポリカーボネートのフィルムなどを同心円状に切り抜いた薄板を用いる。

【００２７】基板１と光透過カバー層２を接着する際には、図示しない加圧板により所定の圧力を印加した上でＵＶ光を照射し紫外線硬化樹脂４を硬化させることによって接着する。

【００２８】情報の記録または再生を行う場合には、光透過カバー層２の側から光線６を対物レンズ７により記録層３に集光する。ＤＶＤと同じ波長でＤＶＤの２倍の面記録密度を達成しようとすると、対物レンズ７のＮＡとしては０．６×１．４、およそ０．８４という値になる。このＮＡにおいて、ＣＤと同程度のディスクの傾きマージンを得ようとすると、光透過カバー層２の厚さは、１．２×（０．４５／０．８４）^{3}、およそ０．１８ｍｍ以下の値を取ればよい。

【００２９】図３に基板１を成型する際の金型の一例を示す。金型８ａおよび８ｂにより基板１が成型された際に、あらかじめ金型８ａ上に形成されていた略同心円状の案内溝が成型直後の基板９に転写されている。成型直後の基板９には中心孔が無いが、成型後、図示しないカッターにより中心部に穴を空ける。

【００３０】図１において、光透過カバー層２の外径は基板１の外径より小さくなっているため、貼り合わせ部がディスクの外周端面に露出していない。このためディスク端面に加わった衝撃が貼り合わせ部に直接伝わらない。したがって、この構造によるとディスク端面に加わった衝撃に対する光透過カバー層の剥離強度が増す。

【００３１】また、光透過カバー層２の内径は基板１の内径より大きくなっているため、貼り合わせ部がディスクの内周端面に露出していない。これによりディスクをチャッキングする際の接触による光透過カバー層の剥離が起こりにくくなる。また、この場合、内縁部に基板が露出している部分ができるため、この部分でディスクをチャッキングすると精度の高いチャッキングが可能となる。

［実施例２］実施例２を図４、図５、図６を用いて説明する。

【００３２】図４に示すように、本実施例では、基板１において、案内溝１０が形成されている内周部１１の基板肉厚に対し、肉厚が厚い外縁部１２を外径付近に設け、同様に肉厚が厚い内縁部１３を中心孔近辺に設けている。なお、上記以外の構造については第１の実施例と同様であるので、ここでは説明を割愛する。

【００３３】この構成をとることにより、基板１と光透過カバー層２を貼り合わした貼り合わせ部を外縁部１２ならびに内縁部１３が保護する形となり、ディスク端面に加わった衝撃やチャッキングの際の接触力が貼り合わせ面に直接加わりにくくなるため、光透過カバー層２と基板１の剥離に対する強度が増す。

【００３４】図４（ａ）において、光透過カバー層は、外縁部の内半径をｒ０、内縁部の外半径ｒ１としたとき、該光透過カバー層の外半径はｒ０より小さく、かつ、該光透過カバー層の内半径はｒ１より大きい外形を有している。

【００３５】また、図４（ａ）において、基板１の内周部１１の基板肉厚に対する外縁部１２の肉厚増加分をΔｔ１、光透過カバー層２の厚さをｔ０としたとき、Δｔ１＜ｔ０としている。

【００３６】基板１と光透過カバー層２を貼り合わせ時には、図４（ｂ）に示すように、加圧版１５によって貼り合わせ圧力を加え、ＵＶランプ１６により紫外線を照射し接着する。貼り合わせ圧力を加える際に、Δｔ１≧ｔ０であれば外縁部１２が出っ張りとなり、貼り合わせ時に圧力むらが生じ易くなる。光透過カバー層２の全体に均一な圧力を加えるためには、Δｔ１と接着時の紫外線硬化樹脂４の厚みを加えたものは、ｔ０より小さくなる必要があり、Δｔ１は少なくともｔ０より小さくあらねばならない。

【００３７】また、貼り合わせ時に圧力を加える加圧版を図５（ｂ）の１５ａおよび１５ｂのように基板１の内縁部１３を逃げる構造とすることにより、図５（ａ）に示すように内縁部を光透過カバー層２よりも突出させることができる。図５（ａ）において、基板１の内周部１１の基板肉厚に対する内縁部１３の肉厚増加分をΔｔ２、光透過カバー層２の厚さをｔ０としたとき、Δｔ２＞ｔ０となる。

【００３８】この構造により、中心孔に基板１と光透過カバー層２の貼り合わせ面が露出していないため、内縁部１３における光透過カバー層２の剥離が発生しにくくなる。

【００３９】さらに、この構造のもう一つの利点を図６を用いて説明する。図６において、ディスク基板はモータ１９上のターンテーブル１８にチャッキング１７によって取り付けられる。ディスクの取り付け精度はターンテーブル１８とディスク下面およびチャッキング１７とディスク上面の精度によって決まる。図６に図示するディスク保持方法では、ディスクをドライブに取りつける際に、貼り合わせられたカバー層の表面でなく、精度の高い成型面を基準面として保持できるため、チャッキング時にディスクが傾いて取り付けられることによるディスク面の傾き（面ぶれ）が発生しにくい。

［実施例３］実施例３を図７および図８を用いて説明する。

【００４０】本実施例のディスクの断面構造図を図７に、断面斜視図を図８に示す。基本的な構造については第１および第２の実施例と同様であるため省略する。

【００４１】本実施例での特徴となるのは、基板１と光透過カバー層２の双方にポリカーボネート等の樹脂材料を用い、基板１の外縁部１２および内縁部１３に突起部１４を設けた。この突起部１４は接着のための加圧時に基板１と光透過カバー層２が接触しているところにある。ＵＶランプにより紫外線硬化樹脂４で接着するとと

もにこの接触している部位を加熱、あるいは超音波により融着する。これにより、ディスク内縁部・外縁部の接着が強化され、剥離に対する強度を高めることができる。

［実施例４］実施例４を図９および図１０を用いて説明する。

【００４２】本実施例として、記録層が２層である貼り合わせディスクにおける貼り合わせ部保護について説明する。

【００４３】第１から第３の実施例では主として光透過カバー層２にポリカーボネートまたはガラスなどの薄板を用いて説明したが、ポリカーボネートのような熱可塑性の樹脂の場合、図９に示すように、案内溝入光透過カバー層２０を成型によって形成することができる。この場合、図９に示すように、基板１の案内溝と、案内溝入光透過カバー層２０の案内溝の双方に記録層を形成し、その間に紫外線硬化樹脂４を充填して加圧・ＵＶ硬化させることにより、記録層が２層あるディスクが実現できる。第１の記録層３ａと第２の記録層３ｂの透過率を適正とすることで図９に示すように第１の記録層３ａおよび第２の記録層３ｂとも案内溝入光透過カバー層２０の側から対物レンズ７を介して光線６により情報を記録または再生することが可能である。この場合も第１から第３の実施例に示した構成を採用することにより、貼り合わせ部がディスクの端面に直接露出しない構造とでき、基板とカバー層の剥離を防ぐことが可能である。

【００４４】また、同様の構成で、案内溝入光透過カバー層２０の案内溝に形成した第２の記録層３ｂの記録密度を、ＮＡの高い対物レンズ第１の対物レンズ７ａに対応して設定し、基板１の案内溝に形成した第１の記録層３ａの記録密度をＮＡの低い対物レンズである第２の対物レンズ７ｂに対応して設定することにより、図１０に示すように、記録密度が高い第２の記録層３ｂをカバー層側から読み出し、記録密度が低い第１の記録層３ａを基板側から再生することが可能である。この時、基板１として、厚さ１．２ｍｍのものを使えば同一のディスクでＣＤ互換記録層と高密度記録層の両方を実現することができる。また、基板１として、厚さ０．６ｍｍのものを使えば同一のディスクでＤＶＤ互換記録層と高密度記録層の両方を実現することができる。このようにすることでＣＤやＤＶＤなど異なる仕様のドライブでも記録または再生できる互換ディスクを提供することができる。

【００４５】

【発明の効果】以上の説明からも明らかなように、本発明によれば、光透過カバー層と基板の貼り合せ部がディスクの外周・内周に露出しないので、貼り合せ部に直接衝撃が加わることがなく、カバー層の剥離が発生しにくい。

【００４６】また、本発明によれば、光透過カバー層と基板の貼り合せ部を、ディスクの外周・内周に設けた外縁部・内縁部が保護するので、貼り合せ部に直接衝撃が加わることがなく、カバー層の剥離が発生しにくい。

【００４７】また、本発明によれば、基板と光透過カバー層の接着にくわえて、外縁部または内縁部を融着するため、衝撃が加わった際の剥離強度が増す。

【００４８】また、本発明によれば、突起により基板とカバー層の密着性が増し、融着強度が増す。

【００４９】また、本発明によれば、剥離しにくい貼り合せディスクにおいて、ＣＤ／ＤＶＤとの互換が容易に実現できる。

【図面の簡単な説明】

【図１】実施例１の光ディスクの断面構造図である。

【図２】基板と光透過カバー層の斜視図である。

【図３】基板の成型方法を説明する概略断面図である。

【図４】実施例２の光ディスクの断面構造図である。

【図５】実施例２の他の光ディスクの断面構造図である。

【図６】実施例２の光ディスクを搭載した光記録再生装置の媒体保持部を示す模式図である。

【図７】実施例３の光ディスクの断面構造図である。

【図８】実施例３の光ディスクの断面斜視図である。

【図９】実施例４の光ディスクの断面構造図である。

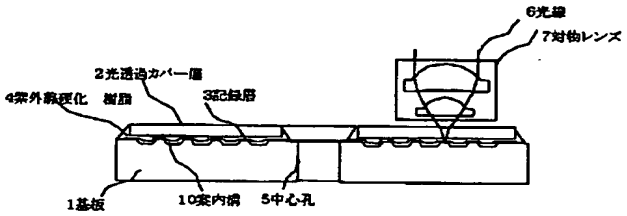
【図１０】実施例４の他の光ディスクの断面構造図である。

【符号の説明】

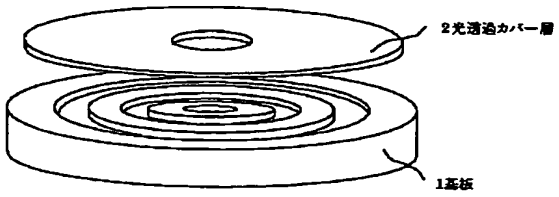
１	基板
２	光透過カバー層
３	記録層
３ａ	第１の記録層
３ｂ	第２の記録層
４	紫外線硬化樹脂
５	中心孔
６	光線
６ａ	第１の光線
６ｂ	第２の光線
７	対物レンズ
７ａ	第１の対物レンズ
７ｂ	第２の対物レンズ
８ａ	第１の金型
８ｂ	第２の金型
９	成型直後の基板
１０	案内溝
１１	内周部
１２	外縁部
１３	内縁部
１４	突起部
１５	加圧板
１５ａ	第１の加圧板
１５ｂ	第２の加圧板
１６	ＵＶランプ

17　チャッキング
18　ターンテーブル
19　モータ
20　案内溝入光透過カバー層

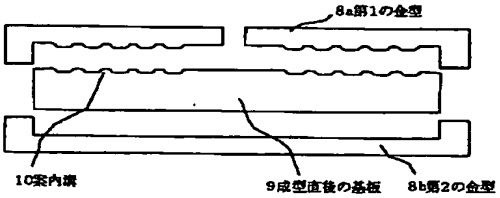
【図1】



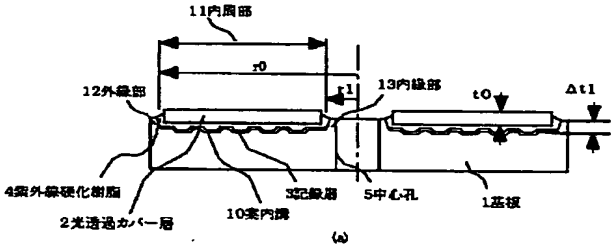
【図2】

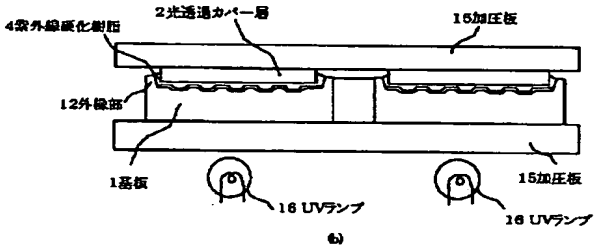


【図3】

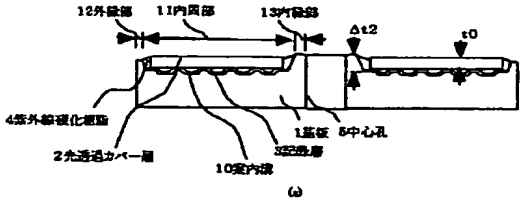


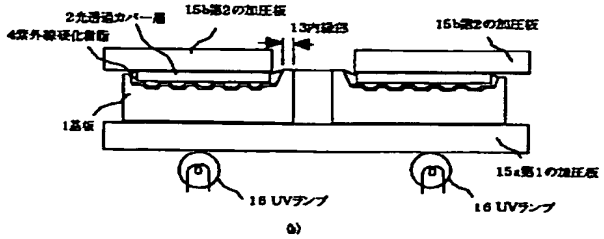
【図4】



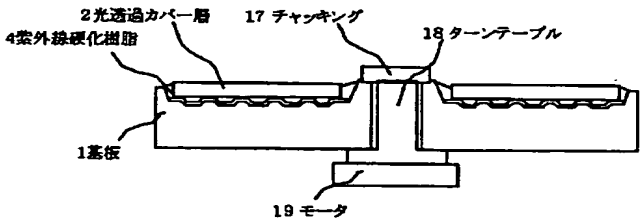


【図5】

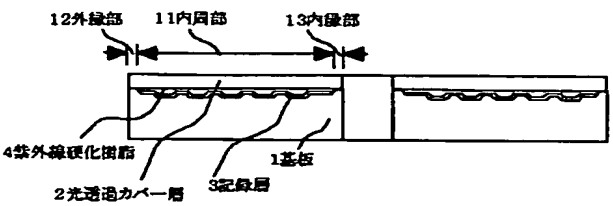




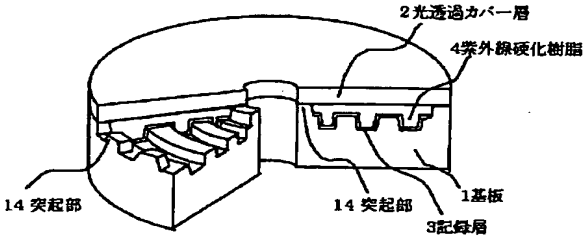
【図6】



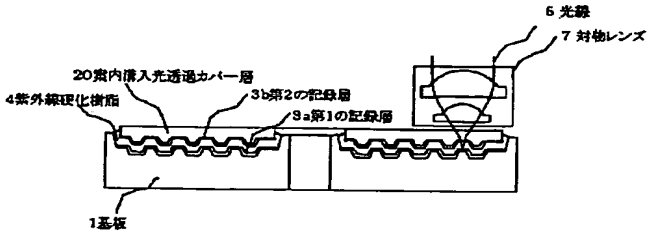
【図7】



【図8】



【図9】



【図10】